

Public Works

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Kilowatt killers

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Kilowatt killers

Getting the most out of energy-saving performance contracts.

A photograph of three men in a large industrial warehouse. The man on the left, Ron Bresser, is wearing a maroon shirt and glasses, with his hands on his hips. The man in the center, Stephen Roosa, is wearing a dark suit and is looking down at a clipboard he is holding. The man on the right, Tom Logan, is wearing a blue shirt and khaki pants, looking towards the other two. In the background, there are various industrial items like a fire truck, a fire hose, and some equipment.

Director of Public Improvements/City Engineer Tom Logan (right) expects Covington, Ky., to save at least \$180,000 annually with a 20-year, \$2.25 million guaranteed-savings performance contract. One upgrade involved replacing fan-forced heating units at the public works garage with gas-fired Enerco Technical Products radiant heaters. Logan worked with consultants Ron Bresser (left) and Stephen Roosa. Photos: Chris Cone/Getty Images



Your town's tax base has been declining, you're caring for century-old buildings with mostly original fixtures, you don't want staff cuts, and your council is determined to recast the community as an arts center irresistible to young professionals with families and all the accoutrements that local retailers provide.

You suspect you're about to be promoted, and you can see the writing on the wall. You need savings that dovetail with elected officials' goals. And you need something that con-

vinces them to go into debt.

You remember something somebody said at some meeting, maybe the local municipal league, about decade-old state statutes that eliminate the lowest-cost requirement on contracts that guarantee energy-related savings over 10, 15, maybe 20 years. What really got your attention, though, was something about the vendor eating the difference if the savings don't materialize.

Looking back, says Tom Logan, director
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of public improvements/city engineer for Covington, Ky., "it looked too good to be true. It took two years to educate ourselves and city officials on the program's technical and financial components. Officials had a difficult time understanding how a contractor could guarantee savings in the millions of dollars."

Ultimately, Logan and Covington Finance Director Bob Due convinced city leaders to borrow \$2.25 million at 4% interest through the Kentucky League of Cities and sign a deal promising to save \$1.9 million — or \$95,000 annually — on gas and electricity bills. Logan expects an additional \$85,000 savings each year through lower or eliminated repair costs, and by eliminating \$70,000 in annual maintenance contracts for police and fire facilities. And the city's on track to receive \$22,000 in one-time rebates and incentives from its local electric and gas provider.

Even assuming a 3% annual increase in energy prices, the loan could be paid off well before the 20-year contract expires. While Logan expects the project will have saved \$2.25 million in 12½ years based on annual savings of \$180,000, he believes that ongoing improvements like installing daylight sensors and timers for parking garage lights will contribute even more.

"Performance contracts are a very important procurement procedure for institutional clients — universities, hospitals, governments — that want savings," says Stephen Roosa, an account executive for Energy Systems Group of Evansville, Ind., Covington's partner. After auditing operations, the 15-year-old consulting firm upgraded building and traffic lighting; installed vending machine controllers, occupancy sensors, energy-management and CO₂-monitoring controls; installed water-efficient appliances; and improved HVAC systems. "They're particularly suited for such entities because energy service companies know such organizations will be around for the duration of a long-term contract."

Now it's up to Energy Systems Group to make good on its promises while making a profit. The company monitors utility bills monthly and, if savings are slipping or not being achieved, dispatches to investigate. Logan and Bresser will review the savings annually.



A technician used to fire up the boiler on Sundays to make sure fire department employees didn't come into a freezing office on Mondays. But the new boiler, controlled by an Invensys Building Systems building-management system, switches itself on when temperatures reach designated levels. Although this January was 17% colder than January 2007, the boiler used 40% less gas.

"The concept is more than 100 years old and growing at about 20% per year," says Shirley Hansen, an internationally known expert in the field and author of *Performance Contracting: Expanding Horizons*. "It started in France with guaranteed energy efficiency in district heating. According to the Energy Department's Federal Energy Management Program, municipalities, universities, schools, and hospitals made up about \$2.6 billion of the \$3.6 billion public-sector market in 2006."

BEYOND BUILDINGS

While public works departments are ripe for savings, energy service companies (known as ESCOs) have been slow to realize the industry's full potential.

According to Hansen, vendors seek partners that pay at least \$250,000 a year in energy bills; and a city hall, library, and police station may not add up that much. But add a water or wastewater treatment plant, which consumes far more energy than any other infrastructure operation, and suddenly the proposal's a win-win proposal for client and contractor.

Jerry Collins Jr. was wastewater treatment administrator in the early 1980s when he installed an aeration optimization (AEROPT) system that's still in service at the 135-mgd Maynard C. Stiles Wastewater Treatment Plant in Memphis. According to Marvin Pate, the consultant who designed and implemented the system, the plant accounted for 40% of the city's energy bills. The drinking water facility represented another 20%, and all other public works operations combined accounted for the rest.

The wastewater treatment contact stabilization activated sludge facility has four 5,000-hp/120,000-cfm blowers, two of which ran constantly and consumed 80% of the energy the plant used. After analyzing the blower system's control logic, Pate realized, as others have since, that the plant could satisfy permit regulations without running the fans 24/7 at full speed.

Pate, who's now overseeing physical plant services for the University of the South in Sewanee, Tenn., installed sensors in the bottom of aeration tanks to monitor dissolved oxygen levels, and wrote a software program (in Fortran) to control the fans to maintain minimum air pressure.

"We were comfortable enough that we lowered the aeration tank dissolved oxygen levels to 0.8 mg/l; previously they were kept at 3.0 mg/l," says Collins, who was promoted to public works director before moving to his present position as president of Memphis Light Gas and Water Utilities. "Any wastewater plant that uses aeration tanks would benefit from this type of system. It's also especially well-suited for systems using centrifugal blowers — the bigger, the better."

While buildings and exterior lighting remain the primary target for public clients, consulting firm Burns & McDonnell is seeing more interest from the wastewater sector because of the need to move forward with necessary capital improvements despite budget constraints.

"Any system that uses some form of energy to operate has potential for energy-savings performance contracting," says Walt Barnes, PE, technology director for the firm's Energy Services Group. "Using the operating cost savings to fund capital improvements can

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Twenty more-modern intersections: 483 incandescent-style, 200 W bulbs were replaced with 5 to 22 W LED traffic signal modules, and 182 pedestrian signal bulbs were replaced with 7 to 11 W LED modules. Considering that bulbs at a typical four-way intersection burn constantly, such upgrades represent a significant reduction in kilowatts per intersection.

often be the answer to fund needed improvements."

The firm has developed projects for treatment plants that include using methane from anaerobic digestion systems to produce heat or fuel generators to support the process. Integrated control systems offer potential savings by avoiding overtreatment and properly handling varying loads. "These control systems also make it possible to manage peak electrical loads that often earn better utility rates," he says.

In Lynnwood, Wash., a 10-year contract with Siemens Building Technologies increased the efficiency of three 200-hp centrifugal blowers for the wastewater treatment plant's secondary aeration basins. Every eight hours, employees were averaging three dissolved-oxygen sensor readings and adjusting inlet valve positions to maintain the 3.0 mg/l set point — more efficient than using an outlet valve to throttle air flows or just over-aerating the basins. But since variable-speed drives were added to the blowers, the fans adjust their speed automatically. By lowering wear and tear on the blowers, the drives eliminated the plant's practice of firing up a different blower, which draws a tremendous spike in power, every month.

The city is so pleased with the financial results that it's looking for partners to explore installing a microturbine on an outfall to help power the plant, reducing energy costs that over time will pay for

the microturbine, says Deputy Public Works Director Jeff Elekes. While the Washington State Department of General Administration pre-qualifies performance contractors every other year, Elekes says the city's going to pre-qualify its own for this project.

THE TIPPING POINT

Some of the energy savings programs described above include third-party maintenance, usually for specialized equipment, but none

include day-to-day maintenance by the energy service company. It's an omission that doesn't optimize the potential benefits of the concept, according to consultant Shirley Hansen.

While many public clients fear losing



positions, energy service companies that keep most of the maintenance often guarantee that personnel won't be cut, freeing employees to concentrate on deferred maintenance. When Hansen was head of the U.S. Department of Energy's Schools and Hospitals Conservation Division, one study revealed that the practices of operations and maintenance employees were responsible for up to 80% of the savings — up to \$4 out of every \$5 saved — on efficiency measures.

"Because the whole scenario rests on guarantees, performance contracting is risk management," Hansen says. Energy service companies manage risks by mitigating some and setting money aside to cover others.

"When the customer is responsible for maintenance, the vendor can hedge the risk by training employees on energy-efficient practices on the new and existing equipment, instituting control procedures like CMMS (computer managed maintenance services), and holding back funds," she says. "The greater the risk, the less of the investment goes into equipment and service. This can really mount up.

"Let's say a customer with a \$10 million utility bill is considering proposals from two potential vendors, and each predicts a 25% savings with a four-year payback. Company A guarantees 75% of the expected savings and Company B guarantees 60%. The customer will lose about \$5 million due to a smaller amount invested and a lower level of savings guaranteed on a 10-year contract if it chooses Company B.

"Potential customers can differentiate the two companies by checking predicted savings against actual savings in referenced projects. The more cautious Company B will have savings as much as 140% above prediction — and brag about it. But in actuality this high level of caution leaves money on the table."

Burns & McDonnell encourages clients to incorporate maintenance contracts for critical equipment, but most use their own staff or contract it separately to other providers during a performance contract period. "Where clients provide their own maintenance services we typically provide a best-practices O&M plan that meets the requirements that affect equipment performance," Barnes says.

As always, explore your options. **PW**

Consumption collaborators

Five ways to maximize your department's relationship with an energy-services company.

Like design-build, which they resemble in concept and execution, performance contracts require managers to relinquish some control over elements they've traditionally dictated. Contractors typically develop engineering designs and specifications, and manage the project from design to installation to monitoring. The customer can keep more control, but this adds to the energy service company's risk, which reduces the level of funds invested in equipment and services.

So while it's tempting to treat performance contracting like any other contract, approaching the partnership with a design-bid-build mindset is counterproductive.

"This is basically a financial transaction, not a technical one," says Shirley Hansen, a 30-year veteran of performance contracting whose next book — *ESCOs Around the World: Lessons Learned in 49 Countries* — will be published next month. "And that makes some managers uncomfortable." Here's what to do:

► **Reduce the likelihood of future sabotage.** The biggest impediment to success are plant engineers, technicians, and other "switch-flippers" who resent the implication that they're inefficient and fear losing their job.

So when forming the committee that will explore performance contracting, make sure these people are included — and listened to — in addition to the finance director, operations supervisors, and plant managers. As discussions continue, rank-and-file will see opportunities for professional growth and find that they'll be able to attack projects they'd put on hold because they lacked sufficient time for thoughtful investigation.

"You'll get a better selection process, and employees will be ready to work with the vendor's employees when they come in," Hansen says.

► **Choose your partner before an energy audit is conducted.** A short project development agreement will protect your interests. A request for proposal (RFP) actually is a request for qualifications; equipment should not be included.

While some public agencies believe they'll save money if they audit operations on their own, most energy-services companies won't provide an RFP based on equipment specified by an unknown engineer. So in the end, the client ends up paying for two audits.

"Sometimes the inclination is to get an audit done first, then try to make the RFP process into a bid based on specifications," says Hansen. "But including equipment in the RFP locks energy-services companies into using equipment that may not provide the savings they'd like to guarantee. These companies sell results, not a particular product or service. They must rely on the equipment or service they provide to deliver the level of savings guaranteed."

► **Don't rely solely on another source for potential partners.** Energy-services companies listed on the Department of Energy's Web site, for example, are required only to submit an application. And because most state statutes focus on energy-savings derived from improvements to public buildings, approved vendors may lack experience in the unique needs of infrastructure operations.

► **Get the right references.** Talk not only to happy clients, but to those where an element of the promised savings went wrong. If the contractor wants your business, it will provide the necessary contact information so you can learn how responsive it was. Also, ask for an audit performed for a facility as similar as possible to yours.

► **Ask for a copy of a signed contract recently executed on behalf of a similar facility.** This reveals what the performance contractor truly committed to providing, not just sales promises. The company will do this if assured the information will be kept confidential.